REMARKS

Claim 1 has been canceled without prejudice. Claim 34 has been added. Support for Claim 34 can be found in original Claim 14, at page 10, lines 17-19; page 10, lines 11-13; page 10, the last line through page 11, line 2; page 11, line 28 through page 12, line 2; and in Figure 3, for example. In accordance with the cancellation of Claim 1 and the addition of Claim 34, Claims 2-14 have been amended. Claim 31 has been amended to incorporate the limitations of Claim 34. Claim 25 has been amended for clarification. No new matter has been added. Applicant respectfully requests entry of the amendments and reconsideration of the application in view of the amendments and the following remarks.

Rejection of Claims 1-6 and 10-33 Under 35 U.S.C. § 103

Claims 1-6 and 10-33 have been rejected under 35 U.S.C. § 103 as being unpatentable over US 6,589,888B2 (Nemani) in view of US 2003/0129827A1 (Lee).

The Examiner asserts that Nemani is silent with respect to oxygen and with respect to flow rates and temperature and other settings, but Lee discloses oxygen doping silicon carbide dielectric layers, the mixed frequencies, the temperature within the recited range, and copper fill. The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the teachings of Lee with the process taught by Nemani in order to obtain the desired properties of the deposited film. Applicant respectfully traverses this rejection.

Claim 34 (new claim)

Claim 34 has been added in place of Claim 1 which has been canceled without prejudice. Claim 34 recites basic film formation (steps (a) and (b)) and active plasma treatment (step (c)). In step (c), a plasma is continuously activated in the reaction zone by increasing flow of the inert gas while decreasing flow of the silicon source, carbon source, and oxygen source, while maintaining the RF energy, thereby reducing a dielectric constant of the silicon carbide film. "A silicon carbide film deposited by the basic film forming step alone is not suitable, ... When an active plasma treatment in this invention is performed on the silicon carbide films, the unstable phenomena of the film stress and dielectric constant are solved. Also the dielectric constant and leakage current is decreased. The silicon carbide film deposited by the PECVD process described herein have significantly lower dielectric constant and lower leakage current in comparison to the conventional silicon carbide films." (page 10, lines 3-16) This two-step method surprisingly stabilizes the silicon carbide film and reduces the dielectric constant and leakage current. That is,

the active plasma treatment changes the properties of the basic film, i.e., the silicon carbide film. It is truly unexpected and surprising that by the active plasma treatment, the properties of the deposited silicon carbide film itself can be improved. The active plasma treatment changes not only the surface of the silicon carbide film but also the silicon carbide film in depth. An embodiment of the two-step method is shown in Figure 3.

Neither Nemani nor Lee teaches or even suggests the significant active plasma treatment. "To establish a *prima facie* case of obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious." (M.P.E.P. § 2143.03) A combination of Nemani and Lee could not lead to Claim 34. Claim 34 could not be obvious over Nemani and Lee, and at least for the reason, the dependent claims also could not be obvious over Nemani and Lee. Applicant respectfully requests withdrawal of this rejection.

Claim 14

Claim 14 has been amended to clarify the invention. As explained above, Claim 14 is dependent on Claim 34, and thus at least for the reason above, Claim 14 could not be obvious. Furthermore, for the following additional reasons, more clearly, Claim 14 could not be obvious:

Claim 14 recites that the oxygen source is O2. As the Examiner admits, Nemani is silent with regard to oxygen. Further, Lee discloses a compound comprising oxygen and carbon (e.g., Claim 1) and carbon dioxide as an example (e.g., Claim 12). However, Lee teaches away from the use of O2. Paragraph 92 of Lee states "Minimal or reduced damage to underlying low k materials was observed for the carbon monoxide and TMS layer compared to the oxygen and TMS layer." That is, the use of O2 damages underlying low k materials in Lee. This is because if O2 is used, side reaction will occur resulting in formation of CuO or Cu2O which consequently has a high risk of Cu diffusing or penetrating through the oxygen-doped silicon carbide layer. Thus, in Lee, it is inevitable to use an oxygen free silicon layer of approximately 5-10 nm as a protective layer (paragraph 87). In contrast, in Claim 14, because of the active plasma treatment step recited in Claim 34, O2 can effectively be used. Thus, for the above additional reason, Claim 14 could not be obvious over a combination of Nemani and Lee. Accordingly, the dependent claims also could not be obvious over the references. Applicant respectfully requests withdrawal of this rejection.

Claim 31

Claim 31 has been amended to clarify the invention by incorporating the limitations of Claim 34. As explained above, Claim 34 could not be obvious over the references. Thus, Claim 31 also could not be obvious over the references. At least for the reason, the dependent claims also could not be obvious over the references. Applicant respectfully requests withdrawal of this rejection.

Rejection of Claims 7-9 Under 35 U.S.C. § 103

Claims 7-9 have been rejected under 35 U.S.C. § 103 as being unpatentable over Nemani in view of Lee, and further in view of US 6,668,752B2 (Yao). The Examiner asserts that Yao discloses varying the carbon content and varying the ratio of silicon source to carbon source. However, Claims 7-9 are dependent on Claim 34, and as explained above, no prior art teaches or suggests the active plasma treatment step. Mere teaching of varying the carbon content and varying the ratio of silicon source to carbon source in the absence of the active plasma treatment step could not render these claims. Applicant respectfully requests withdrawal of the rejection.

CONCLUSION

In light of the Applicant's amendments to the claims and the foregoing Remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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